Water Supply, Planning



SANTA CLARA COUNTY FLOOD CONTROL
AND WATER DISTRICT

March 1967

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Santa Clara County Flood Control
and Water District

ANNUAL SURVEY REPORT

on

GROUND WATER CONDITIONS

1967

March 1967

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7 March 1967

The Honorable Board of Supervisors
County of Santa Clara
70 West Hedding Street
San Jose, California 95110

Gentlemen:

I am pleased to transmit to you the District Engineer's Annual Survey Report on Ground Water Conditions in the Santa Clara County Flood Control and Water District for 1967. The Report was prepared under the authority of Section 26.5 of the District Act and is the fifth of an annual series required as a prerequisite to the levy of the ground water charge on the production of water from the ground water supplies within a zone or zones of the District.

The reported investigation finds that an overdraft condition continues to exist in Zone W-2, the northern ground water basin of the District. The accumulated overdraft in Zone W-2 as of the end of the preceding (1965-66) water year was estimated to be about 760,000 acre-feet, zero acre-feet for the Coyote Ground Water Basin, and 19,000 acre-feet for the Llagas Ground Water Basin. This overdraft exists even though imported water from the Hetch-Hetchy and South Bay Aqueducts is available to the North County areas. Not until the ensuing (1967-68) water year will sufficient supplies of imported water become available to begin to reduce the volume of the accumulated overdraft.

During 1965-66, the first complete year of operation for the South Bay Aqueduct and the District's In-County Raw Water Distribution System, about 29,400 acre-feet of imported water were delivered and used to recharge the ground water basin. Barring long-term outages in the South Bay Aqueduct it is estimated that the District will receive 37,500 acre-feet in the current (1966-67) water year.

The report recommends that a County-wide tax of $.05 per $100 of assessed valuation be levied in the ensuing

The Honorable Board of Supervisors 7 March 1967

(1967-68) water year to defray a portion of the allocated cost of the South Bay Aqueduct and that a ground water charge of $5 per acre-foot for agricultural extractions and $16 per acre-foot for municipal and industrial extractions be levied in the ensuing (1967-68) water year to finance the remaining costs of the South Bay Aqueduct, the costs of the In-County Water Distribution System, and to purchase imported water from the South Bay Aqueduct.

I concur with the findings and recommendations presented in this report and recommend that the suggested ad valorem tax and ground water charges be levied for fiscal year 1967-68.

Sincerely yours,

Donald K. Curlin

Manager-Counsel

Acknowledgments

Valuable assistance and much of the data used in this investigation were contributed by agencies of the State of California and of the County of Santa Clara, by cities, and by private companies and individuals. This cooperation is gratefully acknowledged.

Special mention is made of the helpful cooperation of the following cooperating entities and groups:

San Jose Water Works

Campbell Water Company

City of Sunnyvale

City of Mountain View

City of Milpitas

City of Palo Alto

City of San Jose

City of Los Altos

City of Gilroy

City of Morgan Hill

City of Santa Clara

Leslie Salt Company

Santa Clara Valley Water Conservation District

South Santa Clara Valley Water Conservation District

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INTRODUCTION

This is the fifth annual survey report on ground water conditions in the Santa Clara County Flood Control and Water District and the Zones thereof. It has been prepared in accordance with the requirements of Section 26.5 of the District Act.

The purpose of this report is to inform the District Board of Supervisors of the ground water conditions in the District during the preceding water year*, 1965-66, and to assist the Board in determinations of water supply and water use as of the last day of this water year, 1966-67, and prediction of water supply and water use for the ensuing water year, 1967-68. This information will provide a basis for the Board's determination of ground water charges for the ensuing water year, 1967-68.

The Santa Clara County Flood Control and Water District includes all of Santa Clara County. Within the District three major interconnected ground water basins have been delineated. They occupy about 240,000 acres of the total 849,000 acres in the District. These ground water basins

*Water Year is defined in Section 26.1 of the District Act as "July 1st of one calendar year to June 30th of the following calendar year."

are shown on Plate 1. There are other ground water basins within the County, such as Antelope Valley in the northeastern corner, and many localized ground water supplies are tapped in the mountains and small valleys of the County. Since the use of these supplies at present is small and their development for use elsewhere is not economical, only the three major ground water basins are considered within the scope of this report.

The Santa Clara Valley Ground Water Basin is the most extensive, occupying about 173,000 acres between San Francisco Bay and the Lower Gorge on Coyote Creek just north of Coyote. It is the most utilized ground water source, providing about 170,000 acre-feet of ground water extractions in 1965-66.

The Coyote Ground Water Basin is the smallest of the three major basins; it occupies about 9,000 acres between the northerly Santa Clara Valley Ground Water Basin and a southerly divide in the vicinity of Cochran Road, just northerly of Morgan Hill. Ground water moves out of this basin as subsurface flows both to the north through the Coyote Narrows and to the south. An estimated 14,000 acre-feet of ground water were extracted in 1965-66 for use in this basin.

The Llagas Ground Water Basin is the most southerly one in the District and extends from Cochran Road on the north

to the Pajaro River on the south, occupying about 57,000 acres. In 1965-66 about 70,000 acre-feet of ground water were extracted from this basin for municipal and agricultural purposes.

Zone W-2 was formed on 11 February 1963, encompassing those ground water producing facilities that will benefit from the importation of water via the South Bay Aqueduct. Except for the northwestern area and an area along the western foothills, the boundaries of Zone W-2 shown on Plate 1 are generally coterminous with the Santa Clara Valley Ground Water Basin. Within Zone W-2 all ground water producing facilities are located, registered with the District, and a charge can be levied on water production to support the cost of importing and distributing supplemental water. Because of the close relationship between the areas of importation Zone W-2 and the Santa Clara Valley Ground Water Basin, this report considers them as synonymous and reports the water supply use for Zone W-2 as a ground water basin.

Rainfall on the valley floor and runoff from the tributary watersheds are the major sources of water available to replenish the ground water basins of the District. Surface reservoirs on the major tributary streams store flood runoff that would otherwise be lost for later release to percolation areas, thereby increasing the amount of local

water placed in underground storage.

In the Santa Clara Valley Ground Water Basin the demand for water has exceeded the long-term local water supply, including the augmentation by conservation of stream runoff by reservoirs, as evidenced by the continuing drop of water levels in wells since 1942. To alleviate this undesirable overdraft condition, it is desirable to further augment the ground water supply. Unfortunately, the ground water basin capacity to safely deliver water supplies to the areas of need appears to be less than the present water demand. Therefore it is necessary to reduce ground water pumping by delivering water on the surface to meet that portion of the water demand that exceeds the safe capacity of the ground water basin.

The water needs in excess of the local supply must be provided for by importation of water. The District has contracted for a supplemental supply of water from the State Water Project and has and will continue to construct facilities for the distribution of this water to meet present and future demands of the District. The supply of imported water from the State and from the Hetch Hetchy Aquedcut of the City of San Francisco together with the local supply will not meet the projected future agricultural, municipal and

industrial demands of Santa Clara County and District representatives are actively engaged in contract negotiations for additional imported supplies from the San Felipe Division of the Bureau of Reclamation's Central Valley Project.

The following report is a summation of the volumes of basic data and detailed computations made to determine the ground water conditions, water supply, and water use information required by Section 26.5 of the District Act. The required information is developed and reported in the following sections, together with a summary of findings and recommendations.

WATER SUPPLY AND WATER DISPOSAL

Within any water year the essential elements of water supply to the ground water basins of the District are precipitation on the valley land areas, surface and subsurface inflow, and surface import. This water supply is disposed of by consumptive use including evaporation, surface and subsurface outflow, and surface export. Any difference between the water supply and disposal of water is a surplus or deficiency that causes the ground water table to fluctuate as water is replaced or removed from storage. A long-term deficiency in the annual water supply results in a condition of overdraft of the water stored in the ground water basin.

Precipitation and runoff measurements made at stations throughout Santa Clara County indicate that the local water supply to the ground water basins of the District during the 1965-66 water year was below normal. The seasonal precipitation recorded by the U.S. Weather Bureau at San Jose was about 75 percent of the long-time mean of 14.01 inches while the precipitation station at Gilroy recorded about 71 percent of the long-time mean of 20.15 inches. Precipitation on a District-wide basis averaged about 74 percent of the long-time mean. The seasonal precipitation and accumulated

departure of the seasonal precipitation from the mean for San Jose is shown on Plate II.

The volumes of precipitation which fell on the valley floor area during the 1965-66 water year were 160,000 acre-feet for Zone W-2, 10,000 acre-feet for the Coyote Ground Water Basin, and 69,000 acre-feet for the Llagas Ground Water Basin.

Runoff from streams originating on the west slopes in the Santa Cruz mountains and from the Mount Hamilton Range on the east side of the valley was below the long-term average during the 1965-66 water year. The maximum amount of local water stored in reservoirs upstream of Zone W-2 and the Coyote and Llagas Ground Water Basins was 68,000 acre-feet in a total reservoir capacity of 174,000 acre-feet. During the 1965-66 water year 90,000 acre-feet of local runoff including water from storage was percolated into the Santa Clara Valley Ground Water Basin; 9,000 acre-feet into the Coyote Ground Water Basin; and 24,000 acre-feet into the Llagas Ground Water Basin. At the end of the 1965-66 water year, 7,170 acre-feet of water remained in storage for release to ground water recharge areas in the 1966-67 water year. In addition to the releases for percolation, about 12,000 acre-feet of water was released from storage or diverted from streams

tributary to Zone W-2 and delivered on the surface to meet water demands in this basin.

Surface outflow, that is that portion of the streamflow not utilized within the basins and therefore considered lost, was based on the recorded flow of major streams and estimates of the unmeasured streams. From Zone W-2, about 23,000 acre-feet was lost to San Francisco Bay and 7,000 acre-feet was lost to the Pajaro River from the Llagas Ground Water Basin. The surface outflow from the Coyote Ground Water Basin amounted to about 31,000 acre-feet, but this water was not lost as it became surface inflow to Zone W-2 Ground Water Basin.

Subsurface inflow into Zone W-2 occurs from the adjacent hills, from the Coyote Ground Water Basin, from San Francisco Bay, and from the compaction of subsurface sediments. In the Llagas Ground Water Basin, subsurface water enters from the Coyote Ground Water Basin to the north and from the adjacent hills. In the Coyote Ground Water Basin, subsurface water enters only from the adjacent hills. In the 1965-66 water year about 43,000 acre-feet of subsurface inflow entered Zone W-2; about 3,000 acre-feet entered the Coyote Ground Water Basin and about 13,000 acre-feet entered the Llagas Ground Water Basin. In Zone W-2, two components of sub-surface inflow, inflow from San Francisco Bay and water of

compaction which totaled about 22,000 acre-feet for the 1965-66 water year, are not considered a part of the long-term water supply The subsurface inflow from San Francisco Bay is treated as a change in storage and becomes a part of the annual overdraft and the accumulated overdraft. However, since the water obtained from the compaction of sediments will not be replaced, this item is not part of the accumulated overdraft even though it is a part of the annual overdraft.

Subsurface outflow from the Coyote Ground Water Basin makes up a portion of the subsurface inflow to Zone W-2 and the Llagas Ground Water Basin. The estimated outflow in the 1965-66 water year to the north was about 8,000 acre-feet and to the south about 3,000 acre-feet. From the Llagas Ground Water Basin, the subsurface outflow was estimated to be about 5,000 acre-feet. There was no subsurface outflow from Zone W-2.

An additional supply of water is provided to Zone W-2 by the purchase of imported water from the Hetch-Hetchy Aqueduct of the San Francisco Water Department and the delivery of imported water through the State's South Bay Aqueduct. In the 1965-66 water year 33,600 acre-feet of Hetch-Hetchy Aqueduct water was delivered to the cities of Milpitas, Mountain View, Palo Alto, Sunnyvale, and the Purissima Hills Water District. Of this amount of imported water, 18,500

acre-feet was delivered and used in Zone W-2. In the same period, 29,400 acre-feet was delivered through the South Bay Aqueduct for recharge to the underground storage basin of Zone W-2.

The consumptive use of water in homes, in industry, by agriculture, and by native vegetation is the primary item of water disposal. The average consumptive use of applied water and precipitation within the zones or ground water basins of the District for the 1965-66 water year was estimated to be about 288,000 acre-feet in Zone W-2, 21,000 acre-feet in the Coyote Ground Water Basin, and 114,000 acre-feet in the Llagas Ground Water Basin. These estimates were based on detailed land use information and unit values of consumptive use. In the estimate of consumptive use for Zone W-2 the agricultural component was adjusted downward to reflect the difference in irrigated agricultural acreage shown in the 1961-62 Santa Clara County Planning Department survey (adjusted by new urban development) and that reported to the District with 1965-66 ground water production statements. This downward adjustment results in an irrigated agricultural acreage that is about half that reported for the 1964-65 water year.

Sewage outflow to San Francisco Bay in the north and to the Pajaro River in South Santa Clara County is a water export.

The average discharge of sewage from Zone W-2 during the 1965-66 water year was about 90,000 acre-feet and from the Llagas Ground Water Basin about 3,000 acre-feet. There is no sewage outflow from the Coyote Ground Water Basin.

The actual water supply and disposal conditions in the 1965-66 water year indicate that the water supply did not meet the needs in the separate ground water basins of the District. In Zone W-2 the estimated deficiency was about 54,000 acre-feet; in the Coyote Ground Water Basin it was about 9,000 acre-feet and in the Llagas Ground Water Basin it was about 19,000 acre-feet. This deficiency was supplied from underground storage and resulted in a lowering of the ground water table in each basin. The actual annual water supply and disposal conditions for the three major ground-water basins of the District are summarized in Table 1.

TABLE I
SUMMATION OF THE ANNUAL ITEMS OF
WATER SUPPLY & WATER DISPOSAL
TO THE ZONES OR GROUND WATER BASINS
OF THE DISTRICT FOR THE WATER YEAR 1965-66

Values in Acre-Feet

Item	Ground Water Basin			Total
	Zone W-2	Coyote	Llagas	
Water Supply				
Precipitation	160,000	10,000	69,000	239,000
Stream & Surface Inflow	96,000	40,000	28,000	164,000
Subsurface Inflow	43,000	3,000	13,000	59,000
Import	48,000	0	0	48,000
Subtotal	347,000	53,000	110,000	510,000
Water Disposal				
Consumptive Use	288,000	21,000	114,000	423,000
Stream Outflow	23,000	31,000	7,000	61,000
Subsurface Outflow	0	10,000	5,000	15,000
Export (sewage)	90,000	0	3,000	93,000
Subtotal	401,000	62,000	129,000	592,000
Water Supply-Water Disposal = Surplus (+) or Deficiency (-)	-54,000	-9,000	-19,000	-82,000

GROUND WATER CONDITIONS

The seasonal variations in water supply are regulated naturally by the large volumes of storage space in the ground water basins of the District. The ground water table fluctuates in response to the conditions of water supply and disposal. Extractions in excess of the supply to the ground water basin causes the ground water table to be lowered, whereas a supply in excess of extractions causes a rise in water levels. A long-term lowering of the ground water table below safe and economic operating levels indicates that the seasonal safe yield of the basin has been exceeded and an overdraft condition exists.

Ground Water Table Conditions

In the Zone W-2 and Llagas Ground Water Basins, the major water producing aquifers are separated into two areas by a confining layer of sediments in the downstream area. In this downstream area ground water in the lower aquifers is confined and a change in water levels reflects a change in pressure whereas in the remaining areas the aquifers are unconfined and changes in water levels reflect a change in the amount of water in storage. Above the confining layer of sediments is a shallow aquifer of unconfined ground water that in many areas may be of poor quality. In the Coyote Basin the aquifers are generally

unconfined and changes in water levels reflect a change in the amount of water in storage.

Changes in the elevations of ground water in wells over a period of time at two locations in Zone W-2, at one location in the Coyote Ground Water Basin and at two locations in the Llagas Ground Water Basin are shown on Plates No. III and No. IV. The location of these wells is shown on Plate V. The ground water elevations at Well No. 8S/1E-05N1, located in the unconfined or forebay area of Zone W-2, show an erratic but general decline since 1958. This represents a decrease in the amount of ground water in storage. Well No. 7S/1W-02G1, located in the confined or pressure area, shows a uniform decline in the pressure surface since 1958 with rate of decline more rapid than the decline in the unconfined area. This condition indicates that the confined aquifers lack the capacity to transport ground water from the areas of recharge to the areas of discharge in the quantities being extracted without an excessively steep ground water gradient. To correct this condition it is necessary to reduce extraction to the safe capacity of the confined aquifers and replace the water removed from storage in the unconfined aquifers. At safe capacity the pressure levels will rise to an elevation that would make the basin safe from possible salt water intrusion and control the

subsidence of the ground surface.

The ground water elevation in Well No. 9S/3E-27C2 and the composite hydrograph of Well Nos. 10S/4E-30P5 and 10S/3E-13R1, located in the Llagas Ground Water Basin, show large seasonal variations and a moderate decline from the 1942 levels in the forebay and pressure areas. This stable condition indicates that the confined aquifer may be adequate over the long-term to transport ground water from the areas of recharge to the areas of discharge in the quantities required to meet demands under present conditions of development.

In the Coyote Ground Water Basin the high ground water levels of 1958-59 declined to a water table elevation in 1963 that was deemed desirable for the agricultural pursuits of the area. Since 1963 the ground water elevations in Well No. 9S/2E-12B1 show no general change in ground water levels.

The configuration of the ground water table in 1966 for the three major ground water basins of the District is indicated by the contours shown on Plate V. The ground water table in most of Zone W-2 is below sea level, a condition that has existed since the late 1940's. The well-defined cones of depression indicate that heavy localized pumping exists in the San Jose, Campbell and Cupertino areas. In the San Jose area the heavy localized draft along the Coyote River has depressed the water table in

the Evergreen area to a point where ground water extractions have been limited.

Changes in Ground Water Storage

A difference in the elevation of the ground water table in an unconfined aquifer represents a change in the volume of ground water in storage. Seasonal changes in storage occur when the annual variations in water supply are regulated naturally in the large underground reservoir. An accumulated loss of ground water from storage over a long-term period represents a condition of ground water overdraft. In this report the total loss in ground water storage between a desirable elevation of the ground water table and the present elevation is the accumulated overdraft.

Annual Change in Storage

During the 1965-66 water year the water supply was below normal and did not meet the needs for water in the separate basins of the District. This deficiency in the water supply was met from ground water in storage and the water table dropped in elevation. The change in elevation for the ground water basins from the fall of 1965 to the fall of 1966 is shown on Plate VI.

An estimate of the volume of ground water represented by

the change in ground water levels was made by multiplying specific yield of the sediments by the change in elevation of the ground water levels. This volume was a decrease of about 60,000 acre-feet in Zone W-2, 13,000 acre-feet in the Coyote Ground Water Basin, and 23,000 acre-feet in the Llagas Ground Water Basin for the fall of 1965 to the fall of 1966 period. This change in ground water storage as determined from the ground water contour maps was adjusted to the District water year by subtracting out the increment of ground water recharge that occurred between June 30, 1966 and the date of the 1966 ground water contour map and adding the increment of recharge between June 30, 1965 and the date of the 1965 ground water contour map. This adjustment results in a decrease in the volume of water in underground storage in the 1965-66 water year of 54,000 acre-feet in Zone W-2, 9,000 acre-feet decrease in the Coyote Ground Water Basin; and 19,000 acre-feet in the Llagas Ground Water Basin.

Accumulated Overdraft

The accumulated overdraft is defined as the change (loss) in ground water in storage between a desirable elevation of the ground water table and its present elevation. If it is assumed that a safe operation of the Zone W-2 and Llagas Ground Water basins may be achieved at the water level elevations

represented by the 1942 ground water table and of the Coyote Ground Water Basin by the 1963 ground water levels, then the depletion in storage below these elevations as of the end of the 1965-66 water year is the accumulated overdraft. The depletion in storage as of the end of the 1965-66 water year is about 760,000 acre-feet for Zone W-2, zero acre-feet for the Coyote Ground Water Basin, and 19,000 acre-feet for the Llagas Ground Water Basin. In the Zone W-2 Ground Water Basin the accumulated overdraft includes an estimate for the removal of water from that portion of the basin underlying the Bay which must be replaced when the basin is restored to a safe operation, but it does not include the water obtained from compaction of the sediments caused by the lowered ground water levels. This compaction results in land subsidence and it is believed that restored ground water levels under the safe basin operation will not cause the land surface to regain its former elevations because the compacted sediments cannot be expanded.

Average Seasonal Overdraft

The seasonal volume of water removed from a ground water basin that is not replaced by the long-time average seasonal amounts of water supply had the present or any year's conditions of water supply and disposal existed during the long-time period is the average seasonal overdraft. Estimates of seasonal

overdraft of the zones or ground water basins in the District were determined under a selected set of definitions, assumptions, and cultural conditions that appeared to best fit the actual conditions of water supply and disposal.

For the Zone W-2 and Coyote Ground Water Basins a representative long-term period is from 1935-36 through 1947-48 and for the Llagas Ground Water Basin from 1932-33 to 1947-48.

The basic hydrologic equation states that the water supply must be equal to the water disposal plus or minus a change in storage. To evaluate the long-term seasonal water supply for use in water management it is necessary to adjust the actual seasonal averages to what the averages would be if the 1966 conditions of water supply had existed over the long-term period. The same adjustment is also made for the items of water disposal. These conditions of water supply and disposal under present conditions, as summarized in Table 2 for the zones and ground water basins of the District were equated in the hydrologic equation and the resulting average annual overdraft computed. In Zone W-2 the water of compaction from the consolidation of sediments (ground surface subsidence) is not an element of long-term water supply but is considered a part of the seasonal overdraft since it is dewatered storage that

cannot be replaced. The computed long-term overdraft for the ground water basins of the District is shown in Table 2. In the Coyote and Llages Ground Water Basins the computed average seasonal overdraft is small and assumed to be zero in this report.

TABLE 2

SUMMATION OF THE AVERAGE SEASONAL ITEMS OF WATER SUPPLY AND WATER DISPOSAL UNDER PRESENT CONDITIONS TO THE ZONES OR GROUND WATER BASINS OF THE DISTRICT

Values in Acre-Feet

Item	Ground Water Basin			
	Zone W-1	Coyote	Llagas	Totals
Water Supply				
Precipitation	214,000	15,000	101,000	330,000
Stream & Surface Inflow	160,000	68,000	58,000	286,000
Subsurface Inflow	19,000	4,000	12,000	35,000
Import	48,000	0	0	48,000
Subtotal	441,000	87,000	171,000	699,000
Water Disposal				
Consumptive Use	288,000	19,000	113,000	420,000
Stream Outflow	81,000	60,000	49,000	190,000
Subsurface Outflow	0	8,000	5,000	13,000
Export	90,000	0	4,000	94,000
Subtotal	459,000	87,000	171,000	717,000
Water Supply minus Water Disposal = Average Seasonal Overdraft	-18,000	0	0	- 18,000

GROUND WATER EXTRACTIONS

The amount of water extracted from the basins of the District is an important factor in water resources management. For a desirable safe operation of the underground basins, extractions of water must be limited in quantity and location to the safe yield of the basin under artificial recharge conditions. Therefore, to relate the present condition of the ground water basins to the safe capabilities of these basins it is desirable to know the locations and amounts of extractions.

For an immediate requirement, the ground water extractions are a source of revenue for the ground water recharge programs. Therefore, estimates of the present and future ground water extractions are required to estimate the level of revenue available to both the water importation program and the local conservation program.

Reliable data on the amount of ground water extractions for agricultural uses in the District was not available prior to the 1965-66 water year and past estimates were based on estimates of irrigated acreage, crop type, and assumed seasonal irrigations. The large private water companies and municipal water systems kept excellent records and estimates of municipal and industrial water extractions

were based on recorded information. The ground water production statements submitted by ground water users in Zone W-2 as a requirement of the District's ground water charge for the 1965-66 water year substantiated previous estimates of municipal and industrial water extraction. However, the agricultural ground water production statements in Zone W-2 for the same period reported a ground water extraction less than 42 percent of the volume estimated based on irrigated acreage resulting from an adjustment in the County's 1962 land use study to reflect 1965-66 conditions. The irrigated agricultural acreage reported with the production statements was about 50 percent of the adjusted acreage estimated from the 1962 land use study. These data indicate that the irrigated acreage was grossly overestimated in previous years in Zone W-2.

A program of installation of water meters on agricultural wells producing over 50 acre-feet and non-agricultural wells producing over 5 acre-feet was undertaken in 1965-66. This program was completed in 1966-67 with the installation of 539 meters and a program of maintenance was initiated.

Estimates of urban and agricultural ground water extractions from the basins of the District are shown in

Table 3. The values shown for the water year 1965-66 reflect the actual conditions of water supply, whereas the 1966-67 and 1967-68 values are estimates based on assumed average year conditions and an adjusted agricultural acreage.

TABLE 3

ESTIMATED SEASONAL GROUND WATER EXTRACTIONS IN THE ZONES OR GROUND WATER BASINS OF THE DISTRICT*

Values in Acre-Feet

Ground Water Basin	Zone W-2*	Coyote	Llagas	Total
1965-66				
Agric. Use	39,000	12,000	60,000	111,000
Urban Use	131,000	2,000	10,000	143,000
Total	170,000	14,000	70,000	254,000
1966-67				
Agric. Use	33,000	8,000	45,000	86,000
Urban Use	129,000	2,000	10,000	141,000
Total	162,000	10,000	55,000	227,000
1967-68				
Agric. Use	32,000	8,000	45,000	85,000
Urban Use	127,000	2,000	10,000	139,000
Total	159,000	10,000	55,000	224,000

*Reported values shown for Zone W-2 in 1965-66, all other values based on estimates. Predicted values for 1966-67 and 1967-68 are based on average water supply year.

WATER IMPORTATION PROGRAM

Over the long-term period, the water supply to Zone W-2 of the District has not met the demands for water as evidenced by the estimates of seasonal overdraft and the accumulated overdraft. To alleviate this undesirable condition, it is necessary to import supplemental water to provide for the existing uses in excess of the local supply and the anticipated future increases in water requirements. The District has entered into a contract with the State of California for a supplemental water supply from the State Water Project to help overcome this long-term deficiency in the local supply in the Santa Clara Valley Ground Water Basin. Recognizing the fact that this project will not be able to supply the future needs of the District for supplemental water, the Board of Supervisors of the District has expressed a desire to contract for additional supplies of water from the San Felipe Division of the United States Bureau of Reclamation's Central Valley Project.

The first amount of imported water to be received from the State's South Bay Aqueduct entered Santa Clara County in June, 1965. However, most of this water was test water and regular deliveries of imported water were not received until July, 1965. In the 1965-66 water year about 28,100 acre-feet of water was received and used for ground water recharge along

Penitencia Creek on the east side of Zone W-2 and in the Los Gatos Creek area on the west side. With the completion of the Almaden Valley Pipeline (Unit I) in 1966, 1,300 acre-feet of additional imported water was delivered to the Los Capitancillos Percolation Ponds along Guadalupe Creek in the 1965-66 water year.

In 1967, the quantity of imported water scheduled for delivery will increase to 50,600 acre-feet and in 1968 to 88,000 acre-feet. Most of this imported water will be used to recharge the ground water supply. During 1967, the first water will be treated in the Rinconada Water Treatment Plant and supplied directly to the consumer through existing retail water agencies. This distribution of treated water in Zone W-2 is required because of the apparent limitations of the ground water basin aquifers to transmit needed water supplies to the areas of demand. In order to keep the use of the ground water basin within its safe capacity, an increasing amount of the imported water supply will have to be treated and delivered on the surface.

Since the District's contract with the State of California does not provide an adequate supply of water to meet the expected future needs of Santa Clara County, negotiations are underway for additional supplemental water with the

United States Department of the Interior, Bureau of Reclamation. This water would be delivered through the distribution facilities of the San Felipe Division of the Central Valley Project to a point near the base of Anderson Dam. An expansion of the District's In-County Water Distribution System would connect with this project integrating the major sources of imported water with the local water supplies and enable imported water to be properly distributed in all three major ground water basins.

As previously noted, about 29,400 acre-feet of supplemental water was delivered to Zone W-2 in the 1965-66 water year to help alleviate the annual overdraft. In the current (1966-67) water year, about 37,500 acre-feet of water will be imported, and in the ensuing (1967-68) water year, the District is obligated to import 70,400 acre-feet of water through the South Bay Aqueduct.

Costs and Revenues

To pay for the District's share of the County-wide water importation program, a limited County-wide ad valorem tax and a ground water charge for water extracted from the underground basin or delivered on the surface in lieu of extraction from Zone W-2 was levied in the water year

1966-67. Starting in 1967, charges will be made for the delivery of treated water that will repay all the costs of the treatment plant, its operation and maintenance, and its share of the In-County Distribution System costs.

The major sources of revenue to finance the District's share of the County-Wide Water Importation Program are from the annual ground water charges. Since the charge for the extraction of ground water, or water delivered on the surface in lieu of extractions, is set annually and the charge for the delivery of treated water is set for a five-year period, accurate forecasts of the District's financial status are needed to assist the District's Board of Supervisors in establishing these charges. To provide this financial forecast, the District has modeled the cash flow functions of the District for computer application.

The South Bay Aqueduct is complete except for Del Valle Reservoir, but it is in operation and delivering water to Santa Clara County. Payments must be made to the State for the District's share of the construction, operation and maintenance of the completed aqueduct including the interim United States Bureau of Reclamation charge for water. Revenues collected for the ad valorem tax of five cents per 100 dollars assessed valuation levied by the District

Board of Supervisors in the current (1966-67) water year, after making refunds to areas using Hetch-Hetchy Aqueduct water and including any previous years' carryover, were not adequate to meet the District's share of the capital costs of the South Bay Aqueduct. The ground water charge plus some limited surface water charges was used to meet the remaining capital costs, water charges, operation and maintenance costs and the In-County Water Distribution System costs. The ground water charge in Zone W-2 during the current (1966-67) water year was $5.00 per acre-foot of ground water extracted for agricultural use and $16.00 per acre-foot of ground water extracted for other than agricultural use.

The income and expenditures during 1965-66 water year are given in Table 4. During the ensuing (1967-68) water year, payments to the State will exceed $1,930,000 and the full limited ad valorem tax plus a portion of the ground water charge will be required to meet this commitment. The estimate of the ground water charge required to meet the remaining costs is given in the following paragraphs.

TABLE 4

INCOME AND EXPENDITURES
FOR PRECEDING (1965-66) WATER YEAR

Item	Dollars	Total
Income		$2,767,245
Taxes*	756,956	
Ground Water Charge	1,775,619	
Surface Water Charge	9,603	
Treated Water Charge	0	
Other	225,067	
Expenditures		2,135,949
State		
Capital Cost	753,210	
Fixed Oper. & Maint.	152,616	
Variable Oper. & Maint.	81,905	
Water Charge	130,189	
District		—
Administration & Water Use	174,875	
Engineering	56,294	
Operations	25,660	
Bond Redemption		
Series A	761,200	
Series B	0	

*Net taxes after rebate to cities using Hetch-Hetchy water.

The engineering, right-of-way, and construction costs of the In-County Water Distribution System, including the water treatment plant costs, will be paid from the proceeds of the $42,050,000 bond issue passed by the electorate in June, 1963. Bonds sold will be repaid with revenues from the ground water charges and the sale of treated water. The first sale of bonds in January, 1964, totaled $15,500,000 and will be repaid at a rate of about $750,000 per year over a period of 39 years. The second sale of bonds in May, 1966, totaled $14,200,000 and will be repaid at a rate of about $705,000 per year over another 39-year period.

Construction of the Central Pipeline, the first phase of the In-County Water Distribution System, was completed in 1965 and is delivering South Bay Aqueduct water to the Los Gatos area. Construction of the Almaden Valley Pipeline (Unit I), the second phase of the System, was completed in 1966 and under District operation in the 1965-66 water year. Construction of a major portion of the third phase, the Rinconada Water Treatment Plant, Rinconada Force Main and the West Pipeline (including the Santa Clara and Campbell Distributaries) will be completed in the current (1966-67) water year and treated water deliveries are scheduled to start in the spring of 1967. Engineering design on the

remaining feature of the third phase construction program, the supervisorial control and telemetry system, is nearly complete and the project will be advertised for construction proposal in the current 1966-67 water year.

Estimated expenditures during the ensuing (1967-68) water year are tabulated in Table 5.

TABLE 5

ESTIMATED EXPENDITURES DURING 1967-68
(Exclusive of Costs Assignable to
Treated Water Program)

Purpose	Estimated Expenditure
State of California	
Capital Cost	$1,200,400
Fixed Operation and Maintenance	187,800
Variable O & M	412,400
Delta Water Charge	131,200
District Expenses	
(a) Administration and Water Use	229,000
(b) Engineering	105,000
(c) Operations	84,000
Bond Redemption	
Series A (1st bond sale)	753,950
Series B (2nd bond sale)	74,450
TOTAL	$3,178,200

Recommended Ground Water Charges

The total estimated expenditures exclusive of those expenditures repaid by the treated water charge during 1967-68 will be paid from current revenues from the ad valorem tax and ground water charges. It is estimated that the five cents per 100 dollars assessed valuation ad valorem tax will raise a net

amount of about $841,100.[1] This leaves about $2,337,100 to be raised by the ground water charges. Applying the $5.00 per acre-foot rate to the recommended estimate of agricultural ground water production for 1966-67 from Table 3 would raise about $165,000. Revenue from surface delivered agricultural water is estimated to be an additional $34,000. The remainder of the costs would have to be assessed against the ground water production, and water delivered on the surface in lieu of ground water, for uses other than agriculture. Therefore, this ground water charge will have to be $15.72 per acre-foot. Projections of estimated expenditures and revenue by the computer model indicate that the ground water charge for water extracted for other than agricultural uses should vary between $15.00 and $17.00 per acre-foot to maintain a solvent ground water program during the next few years. Therefore it appears that if the ground water charge for water other than agricultural uses is held at $16.00 per acre-foot, it will be possible to meet anticipated costs for the next few years

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[1] The ad valorem tax is estimated to raise a total of $968,600, but under the pricing policy adopted before the bond issue, a portion of this revenue will be returned to those cities obtaining all or a part of their water supply from the Hetch-Hetchy Aqueduct. This rebate is estimated to amount to $127,500 leaving a net revenue of $841,100.

including the ensuing (1967-68) water year without minor inconvenient vacillations in the assessed rate. It is therefore recommended that the ground water charge for water used for other than agricultural purposes be set at $16.00 per acre-foot for the 1967-68 water year.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Pursuant to Section 26.5 of the Santa Clara County Flood Control and Water District Act, an investigation of the ground water conditions of the District and Zones thereof has been completed. This chapter presents a summary of the findings derived from the results of this investigation and recommendations based upon these findings.

Summary of Findings

1. The major ground water basins of the Santa Clara County Flood Control and Water District are the Santa Clara Valley Ground Water Basin in the northern portion of the County, the Coyote Ground Water Basin in the center of the District, and the Llagas Ground Water Basin in the southern portion of the District.

2. A ground water charge zone, Zone W-2, was established on February 11, 1963. Zone W-2 includes most of the Santa Clara Valley Ground Water Basin within its boundaries.

3. The seasonal water supply Surplus (+) or Deficiency (-) to the zones or ground water basins of the District for the preceding (1965-66), current (1966-67), and ensuing (1967-68) water years is estimated to be (in acre-feet):

	Preceding	Current	Ensuing
Zone W-2	- 54,000	+3,000	+29,000
Coyote G.W.B.	- 9,000	-3,000	- 3,000
Llagas G.W.B.	- 19,000	-7,000	- 8,000

4. The accumulated overdraft represented by the change in ground water storage between the ground water table elevation in 1942 (assumed desirable) and 1966 is estimated to be:

Zone W-2	760,000 acre-feet
Coyote Ground Water Basin	zero acre-feet
Llagas Ground Water Basin	19,000 acre-feet

5. The primary source of water put to beneficial use in the zones or ground water basins of the District is ground water and the total extractions in acre-feet during the preceding (1965-66), current (1966-67) and ensuing (1967-68) water years is estimated to be:

	Preceding	Current	Ensuing
Zone W-2	170,000	162,000	159,000
Coyote G.W.B.	14,000	10,000	10,000
Llagas G.W.B.	70,000	55,000	55,000

6. The estimated amount of ground water to be extracted for agricultural use from the zones or ground water basins of the District during the ensuing (1967-68) water year is:

Zone W-2	32,000 acre-feet
Coyote Ground Water Basin	8,000 acre-feet
Llagas Ground Water Basin	45,000 acre-feet

7. The estimated amount of ground water to be extracted for uses other than agricultural use from the zones or ground water basins of the District during the ensuing (1967-68) water year is:

Zone W-2	127,000 acre-feet
Coyote Ground Water Basin	2,000 acre-feet
Llagas Ground Water Basin	10,000 acre-feet

8. A program for the importation of supplemental water to help alleviate the current and accumulated ground water overdrafts in the Santa Clara Valley Ground Water Basin has been formulated and a contract signed with the State to supply a maximum annual amount of 100,000 acre-feet. Initial deliveries were made in June 1965 from the South Bay Aqueduct. In the ensuing (1967-68) water year the District is obligated to import 70,400 acre-feet through the South Bay Aqueduct.

9. An In-County Water Distribution System to deliver imported water to the points of ground water recharge and to water treatment plants for delivery on the surface to retail customers in Zone W-2 is being constructed. Construction of the Central Pipeline was completed in 1965 and construction

of the Almaden Valley Pipeline--Unit I was completed in the 1965-66 water year. Contracts have been signed for the initial delivery of treated water in May, 1967, and construction of the Rinconada Water Treatment Plant, the Rinconada Force Main and West Pipeline (including the Santa Clara and Campbell Distributaries) will be completed in 1967. Design of the supervisory control and telemetry system will be completed and construction undertaken in 1967.

10. Expenditures for the District's share of the costs of construction, maintenance and operation of the South Bay Aqueduct, including the Delta Water Charge, in the ensuing (1967-68) water year are estimated to amount to $1,931,800. Bond redemption charges during the ensuing (1967-68) water year are estimated to amount to $1,464,400 of which $636,000 is assignable to the treated water program, and District expenses, including operation costs of the In-County Distribution System, will amount to about $820,000.

11. A county-wide ad valorem tax of 5 cents per 100 dollars assessed valuation will not provide sufficient revenues in the ensuing (1967-68) water year to meet the anticipated expenditures for the capital cost portion of the costs to the District of the South Bay Aqueduct.

12. A ground water charge based on estimates of

production from the ground water supplies in Zone W-2 of five dollars per acre-foot for agricultural extractions and $15.72 per acre-foot for non-agricultural extractions is necessary to meet anticipated expenditures in the ensuing (1967-68) water year. To generate a reserve in anticipation of future deficits, the ground water charge rate for water extracted for other than agricultural use should remain at $16.00.

Recommendations

Based on these findings, it is recommended:

1. That the District complete the construction of the present phases of the In-County Water Distribution System, including the treated water facilities, in order to distribute the quantities of imported water that the District is obligated to purchase and treat the water the District is obligated to deliver in the ensuing years.

2. That a county-wide ad valorem tax of 5 cents per 100 dollars assessed valuation be continued for the ensuing (1967-68) water year and collected to pay a portion of the anticipated charges for the District's share of the construction of the South Bay Aqueduct.

3. That a ground water charge of five dollars per acre-foot for agricultural extractions and $16.00 per acre-foot for non-agricultural extractions be levied and collected in Zone W-2 for the ensuing (1967-68) water year to pay the remaining charges to the State, the distribution system operation charges, and the bond redemption charges for the In-County Water Distribution System.

4. That the District Board of Supervisors make the following determinations for Zone W-2 in accordance with

Section 26.6 of the District Act.

a. The annual water supply deficiency for the preceding (1965-66) water year was about 54,000 acre-feet.

b. The estimated annual water supply for the current (1966-67) water year based on an estimate of average natural water supply plus the expected water importation will be about 3,000 acre-feet greater than the projected water disposal.

c. The estimated annual water supply for the ensuing (1967-68) water year based on an estimate of average natural water supply plus the expected water importation will be about 29,000 acre-feet greater than the projected water disposal.

d. The accumulated overdraft as of the last day of the preceding (1965-66) water year was about 760,000 acre-feet.

e. The amount of ground water (as reported in production statements) extracted in the preceding (1965-66) water year was 130,786 acre-feet for non-agricultural uses and 38,535 acre-feet for agricultural uses.

f. The estimated amount of agricultural water to be withdrawn from the ground water supplies of Zone W-2 for the current (1966-67) water year is about 33,000 acre-feet.

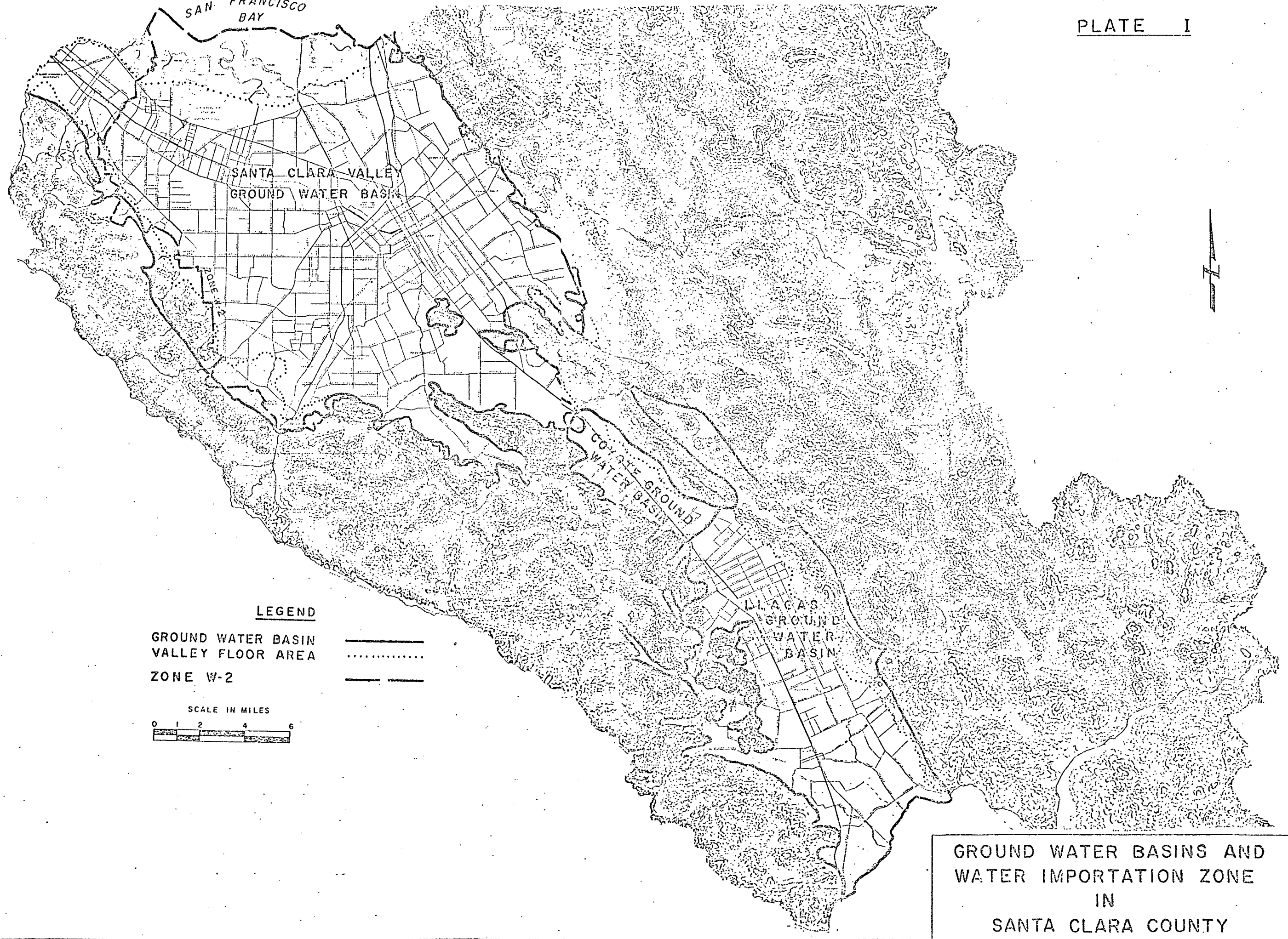
g. The estimated amount of water other than agricultural water to be withdrawn from the ground water supplies of Zone W-2 for the current (1966-67) water year is about 129,000 acre-feet.

h. The estimated amount of agricultural water to be withdrawn from the ground water supplies of Zone W-2 for the ensuing (1967-68) water year is about 32,000 acre-feet.

i. The estimated amount of water other than agricultural water to be drawn from the ground water supplies of Zone W-2 for the ensuing (1967-68) water year is about 127,000 acre-feet.

j. The District is obligated by contract to purchase about 70,400 acre-feet of water in the ensuing (1967-68) water year.

PLATE I



GROUND WATER BASINS AND WATER IMPORTATION ZONE IN SANTA CLARA COUNTY

PLATE II

RECORDED SEASONAL PRECIPITATION AND ACCUMULATED DEPARTURE FROM THE AVERAGE AT SAN JOSE

SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT

MARCH 1967

ACCUMULATED DEPARTURE FROM THE AVERAGE

1874-1966 AVERAGE 14.01 INCHES

PRECIPITATION IN INCHES

ACCUMULATED DEPARTURE FROM THE AVERAGE SEASONAL PRECIPITATION IN PERCENT.

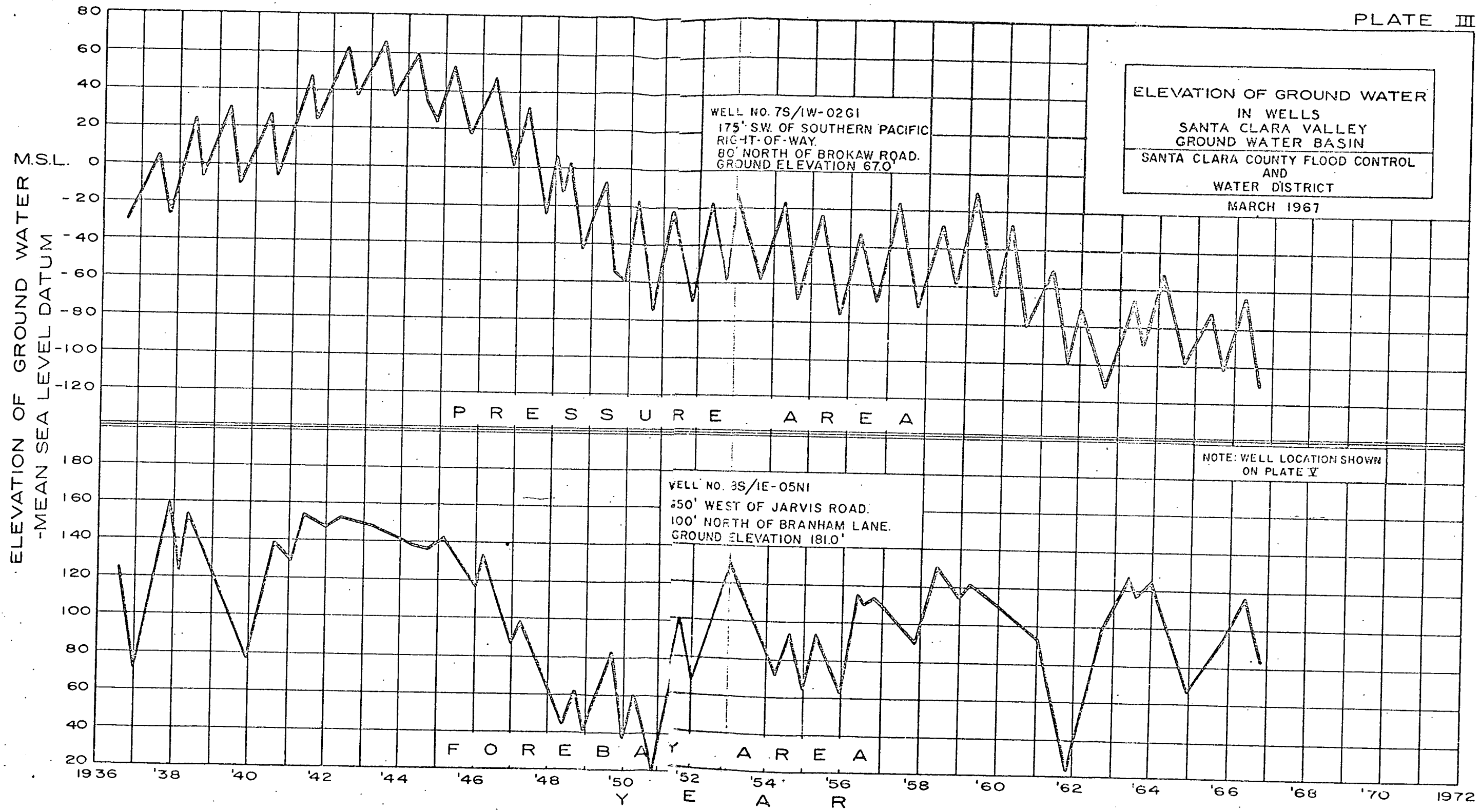
YEAR

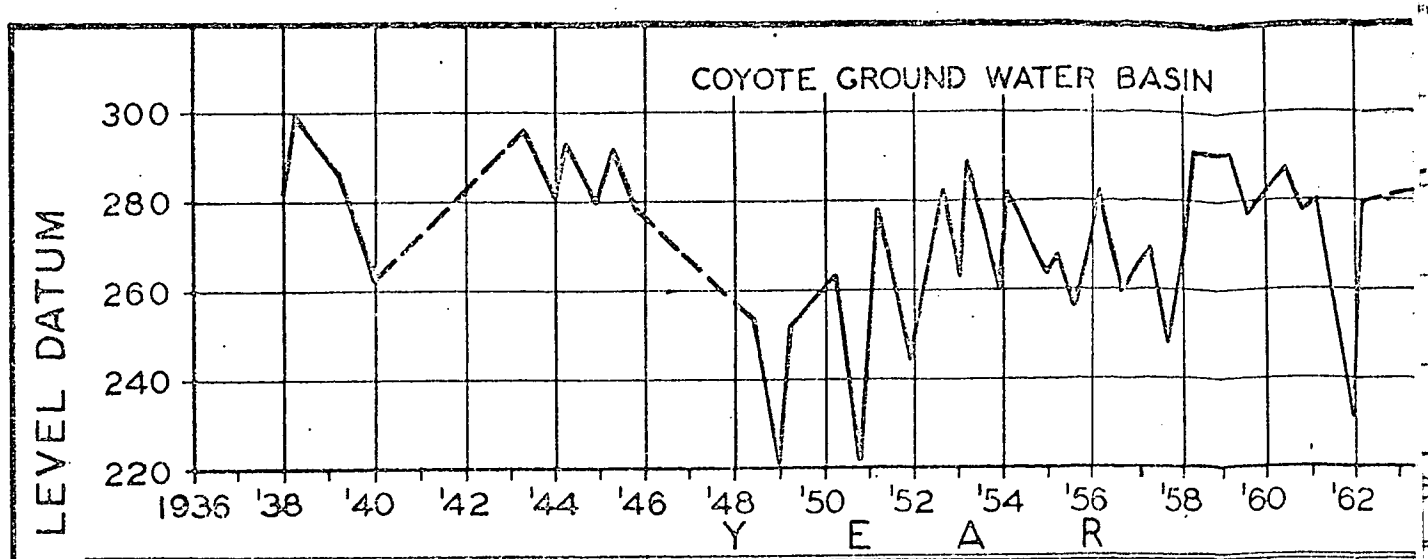
PLATE III

ELEVATION OF GROUND WATER IN WELLS SANTA CLARA VALLEY GROUND WATER BASIN

SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT

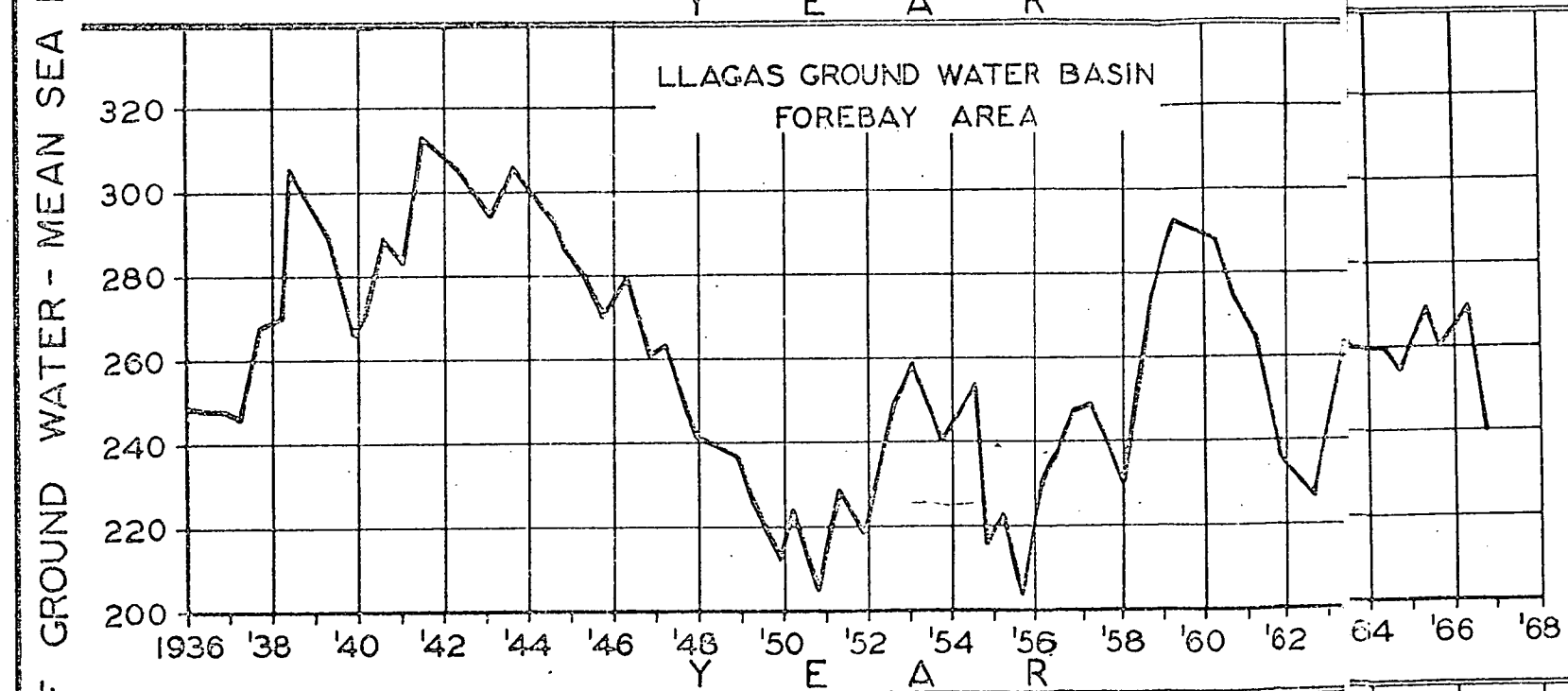
MARCH 1967



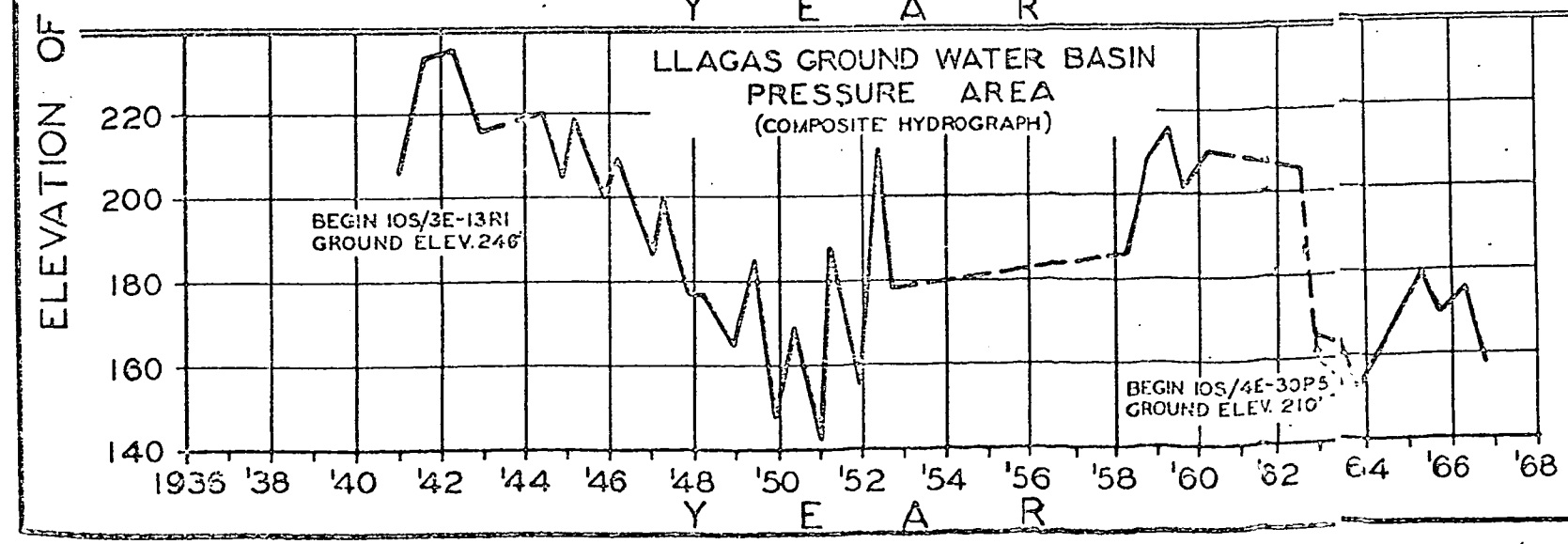


WELL NO. 9S/2E-12B1
2100' S.W. OF MONTEREY HWY
40' N.W. OF MIRAMONTE AVE.
GROUND ELEVATION 312.0'

NOTE: WELL LOCATION SHOWN ON PLATE V



WELL NO. 9S/3E-27C2
6350' N.E. OF MONTEREY HWY
300' S.E. OF SAN PEDRO AVE.
GROUND ELEVATION 347.0'



WELL NO. 10S/3E-13R1
2700' N.E. OF MONTEREY HWY
100' S.E. OF MASTEN AVE.

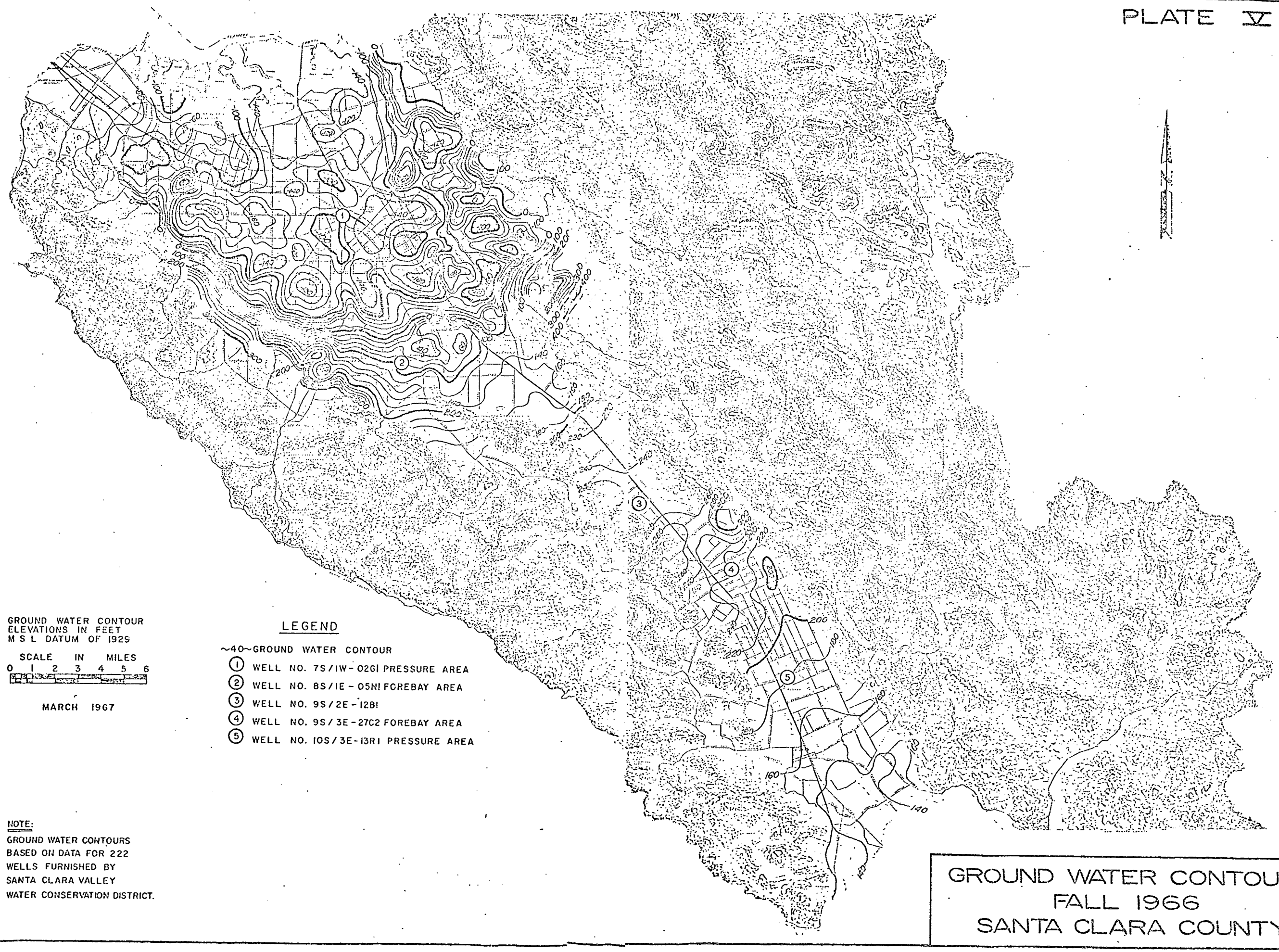
WELL NO. 10S/4E-30P5
2300' N.E. OF MONTEREY HWY
100' S.E. OF LAS ANIMAS AVE.

ELEVATION OF GROUND WATER IN WELLS

SANTA CLARA COUNTY FLOOD CONTROL AND WATER DISTRICT

MARCH 1967

PLATE V



GROUND WATER CONTOUR
ELEVATIONS IN FEET
M S L DATUM OF 1929

SCALE IN MILES
0 1 2 3 4 5 6

MARCH 1967

LEGEND

~40~ GROUND WATER CONTOUR

① WELL NO. 7S/1W-02G1 PRESSURE AREA

② WELL NO. 8S/1E-05N1 FOREBAY AREA

③ WELL NO. 9S/2E-12B1

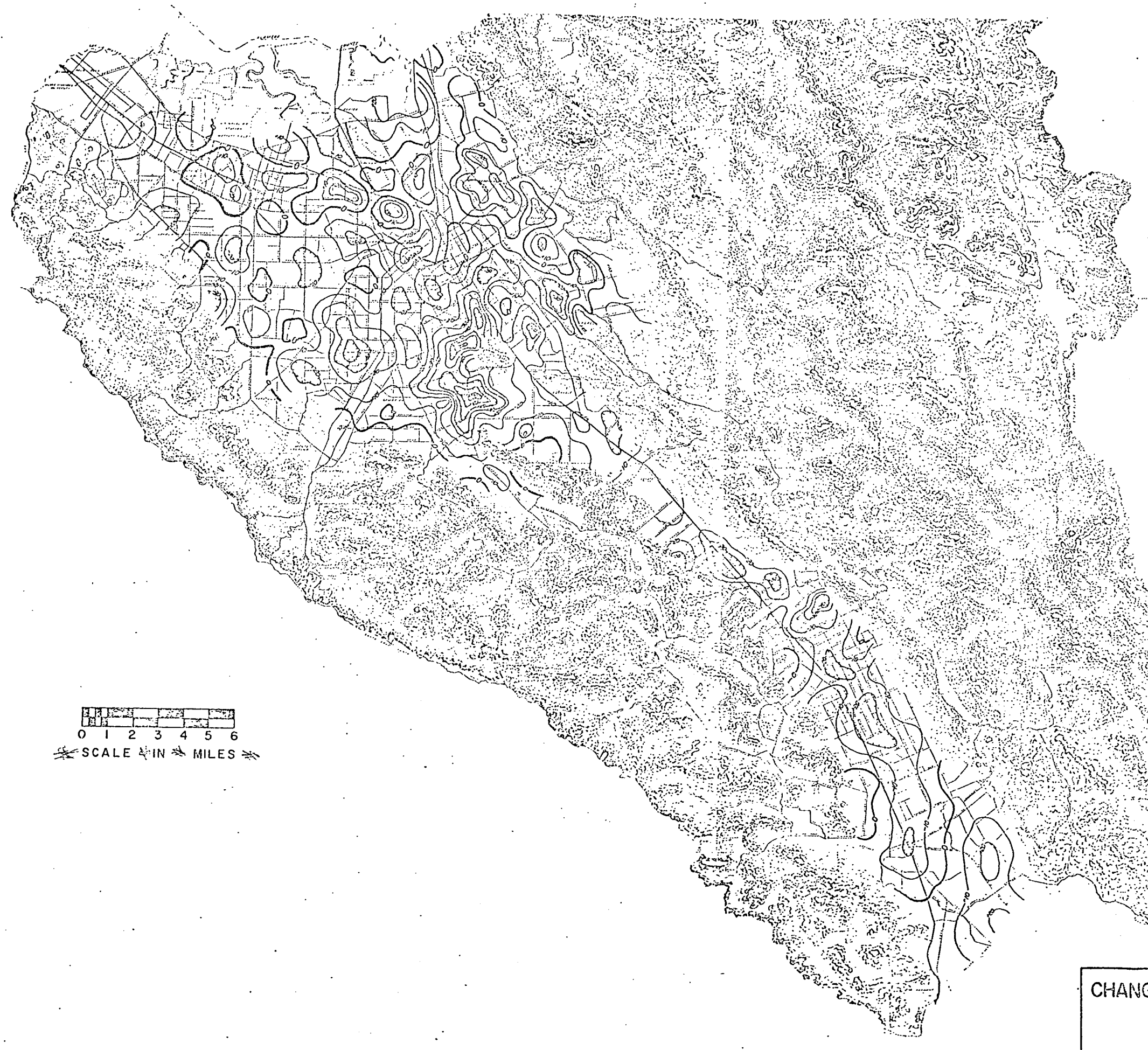
④ WELL NO. 9S/3E-27C2 FOREBAY AREA

⑤ WELL NO. 10S/3E-13R1 PRESSURE AREA

NOTE:
GROUND WATER CONTOURS
BASED ON DATA FOR 222
WELLS FURNISHED BY
SANTA CLARA VALLEY
WATER CONSERVATION DISTRICT.

GROUND WATER CONTOURS
FALL 1966
SANTA CLARA COUNTY

PLATE VI



N

0 1 2 3 4 5 6

SCALE IN MILES

CHANGE IN GROUND WATER ELEVATIONS
FALL 1965 TO FALL 1966
SANTA CLARA COUNTY